

AD-A271 807



REPORT DATE 24 Dec 89		3. REPORT TYPE AND DATES COVERED In-Progress 16 Aug 91	
1. TITLE AND SUBTITLE Commercial Training Device Requirement (CTDR) for the Driver Skill Trainer (DST)		5. FUNDING NUMBERS CARDS CTDR 1651R	
6. AUTHOR(S) U.S. Army Training Support Center ATTN: ATIC-DM Fort Eustis, VA 23604-5166		8. PERFORMING ORGANIZATION REPORT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) PM, Training Devices ATTN: AMCPM-TND Central Florida Research Park 12350 Research Parkway Orlando, FL 32826-3276		10. SPONSORING/MONITORING AGENCY REPORT NUMBER CARDS CTDR 1651R	
11. SUPPLEMENTARY NOTES CTDR was originally approved by TRADOC on 24 Dec 89; this CTDR dated 21 Jul 91 is an approved revision. System is fielded; 8 Oct 93.			
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for Public Release; Distribution is Unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The Driver Skill Trainer (DST) demonstrates situational awareness and judgement in the operation of a wheeled motor vehicle under varying roadway traffic conditions and in emergency driving situations.			
14. SUBJECT TERMS CARDS CTDR 1651R; Commercial Training Device Requirement; Driver Skill Trainer; DST; Vehicle, trainer;		15. NUMBER OF PAGES 13	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT SAR

DTIC
ELECTE
OCT 29 1993
S A D



DEPARTMENT OF THE ARMY
U. S. ARMY TRAINING SUPPORT CENTER
FORT EUSTIS, VIRGINIA 23604-5166

REPLY TO
ATTENTION OF

16 AUG 1991

ATIC-DM (350)

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Commercial Training Device Requirement (CTDR) for the Driver Skill Trainer (DST)

1. Reference Army Regulation 71-9, 20 Feb 87, Materiel Objectives and Requirements.

2. Subject CTDR originally approved by HQ TRADOC on 24 Dec 89 has been revised. The changes to the document at enclosure 1 were approved by HQ TRADOC on 21 Jul 91. Changes are underlined for easy reference. Implementing instructions applicable to this device are:

- a. System Designation: ACAT IV.
- b. Materiel Developer: AMC.
- c. Combat Developer: TRADOC.
- d. Trainer: TRADOC.
- e. Logistician: USAMSAA.
- f. Operational Tester: OPTEC
- g. TRADOC Proponent: U.S. Transportation School
Fort Eustis, VA
- h. CARDS Reference Number: 1651R.

3. The document is forwarded to major Army commands, other services, and other DOD agencies for appropriate action. It is forwarded to all other addressees for information.

4. Point of contact for this action is Mr. Hal Hansen, AUTOVON 927-4218/5843.

FOR THE COMMANDER:

Encl

93-26076



Thalia B. Church
THALIA B. CHURCH
Captain, AG
Adjutant General

Accession for	
NTIS	CRASH
DTIC	7-10
Unprocessed	Good
Justification	
By	
Distribution	
Available	
Dist	Avail
A-1	

93 10 27 021
27

CTDR-6

ATIC-DM

SUBJECT: Commercial Training Device Requirement (CTDR) for the Driver Skill Trainer (DST)

DISTRIBUTION:

HEADQUARTERS, DEPARTMENT OF THE ARMY, ATTN: DACA-CAM/DACS-DPA/
DAEN-FSP/DALO-SSM-E/DAMA-PPM/DAMI-ZA/DAMO-FDR/DAGS-HCL/DAAR-TR

COMMANDER IN CHIEF

U.S. ARMY EUROPE AND SEVENTH ARMY, ATTN: AEAGC-T
MILITARY AIRLIFT COMMAND, ATTN: MAC/XPO

COMMANDER

7TH ARMY TRAINING COMMAND, ATTN: AETT-TD
U.S. ARMY INFORMATION SYSTEM COMMAND, ATTN: ASPE-TN
U.S. ARMY MATERIEL COMMAND, ATTN: AMCDE-S/AMCLD-TILO/AMCICP-IM
EIGHTH U.S. ARMY, ATTN: J3/AFTE-LO-AK
FORCES COMMAND, ATTN: FCJ3-TSD
U.S. ARMY HEALTH SERVICES COMMAND, ATTN: HSHA-DTD
U.S. ARMY INTELLIGENCE AND SECURITY COMMAND, ATTN: IAOPS-PL
U.S. ARMY JAPAN
MILITARY TRAFFIC MANAGEMENT COMMAND, ATTN: MT-PEM
U.S. ARMY TRAINING AND DOCTRINE COMMAND, ATTN: ATTG/ATCD/
ATRM/ATPL/ATDO/ATEN/FLD ELEMENT
U.S. ARMY WESTERN COMMAND, ATTN: AFOP-TR
U.S. ARMY TRAINING CENTER AND FORT DIX, ATTN: ARZD-DIO
U.S. ARMY SIGNAL CENTER AND FORT GORDON, ATTN: ATZH-DTN
U.S. ARMY SOLDIER SUPPORT CENTER AND FORT BENJAMIN HARRISON,
ATTN: ATSG-DTN
U.S. ARMY TRAINING CENTER AND FORT JACKSON, ATTN: ATZJ-PTSA
U.S. ARMY TRAINING COMBINED ARMS CENTER AND FORT LEAVENWORTH, ATTN:
ATZL-TAS-T
U.S. ARMY AVIATION CENTER AND FORT RUCKER, ATTN: ATZQ-TD-TAD
U.S. ARMY TRAINING CENTER, ENGINEER, AND FORT LEONARD WOOD,
ATTN: ATZT-DPT
AIR FORCE SYSTEMS COMMAND, ATTN: SDTA/SDO
FOREIGN SCIENCE AND TECHNOLOGY CENTER, ATTN: DRXST-PO
TRADOC COMBINED ARMS TEST ACTIVITY, ATTN: ATCT-OP
U.S. ARMY COMBINED ARMS CENTER LIAISON OFFICE, ATTN: ATZL-CAL-AK
U.S. ARMY INTELLIGENCE CENTER AND SCHOOL, ATTN: ATSI-TD-NSC
U.S. ARMY JOHN F. KENNEDY SPECIAL WARFARE CENTER AND SCHOOL,
ATTN: ATSU-TD
U.S. ARMY LOGISTICS EVALUATION AGENCY, ATTN: DALO-LEI
U.S. ARMY LOGISTICS CENTER, ATTN: ATCL-MS/ATCL-TAA
U.S. ARMY ORDNANCE CENTER AND SCHOOL, ATTN: ATSL-DD/ATSL-CLC-M
U.S. ARMY OPERATIONAL TEST AND EVALUATION COMMAND, ATTN: TRADOC LO
U.S. ARMY RESEARCH, STANDARDIZATION GROUP, CANADA
U.S. ARMY RESEARCH, DEVELOPMENT AND STANDARDIZATION GROUP,
UNITED KINGDOM
U.S. ARMY RESEARCH, DEVELOPMENT AND STANDARDIZATION GROUP,
AUSTRALIA
(CONT)

COMMERCIAL TRAINING DEVICE REQUIREMENT
FOR DRIVER SKILL TRAINER (DST)

1. Title of Item:

- a. Title: Driver Skill Trainer (DST)
- b. CARDS Reference Number: 1651R

2. Category:

- a. Armywide
- b. \$15,000 and over

3. Currently on hand: 0

4. Justification:

a. The Driver Skill Trainer (DST) demonstrates situational awareness and judgement in the operation of a wheeled motor vehicle under varying roadway traffic conditions and in emergency driving situations. The device reinforces hands-on vehicle operation by providing realistic skill training in difficult to replicate traffic conditions and in prohibitively unsafe emergency reaction maneuvers. We have identified an Armywide need for a truck driver trainer at institutional and unit-operated training centers, both in CONUS and overseas commands, Active and Reserve Components. Many current driving problems in the field cannot be economically or effectively duplicated to apply a training solution. Hands-on driving in life-threatening or accident-causing conditions is not currently trained, yet these are essential elements in developing proper driving skills. Driver training conducted in the field today is, for the most part, command-resourced, decentralized and non-standard. Task vehicles are used as trainers at considerable cost in terms of fuel, maintenance and mission availability.

b. OPTEMPO reductions in POL/maintenance costs may be realized as some training now conducted on unit vehicles is transferred to the training device. Reserve component units, who already experience training time and equipment constraints, will benefit from the accessibility of the device. Army motor vehicle

REVISED JUL 91

accident rates will decline as safety-awareness and emergency-reaction training is incorporated into the device training strategy. Students will be afforded invaluable hours of practical interaction with computer-generated driving scenarios which both prompt desired behavior and identify shortcomings requiring improvement, thus producing a more proficient, safety-conscious motor vehicle operator. With the potential to alter the driving skills of 150,000 military drivers, the device has immense value and, given that it is of expandable design, its potential to adapt to changing Army driver training requirements is limited only by the technological advance of software products.

c. This device will meet the safety training objectives identified in AR 600-55, Motor Vehicle Driver and Equipment Operator Selection, Training, Testing and Licensing and FM/TC 21-305 (Draft) Manual for the Wheeled Vehicle Driver, March 1989.

d. In addition to training all of the Army's drivers for annual re-licensing, the device will train tasks (Annex C) in the Programs of Instruction (POI) for the following MOS:

<u>MOS</u>	<u>STUDENTS PER YEAR</u>	<u>PROPONENT</u>
88M, Motor Vehicle Operator	8000	USATSCH
77F, Petroleum Supply Specialist	1800	USATSCH

5. Characteristics:

a. General: The system should have the following general characteristics:

(1) Consist of a student station, visual display, sound system, instructor operating station, and computer system. Each of these elements will interact to create the effect of operating a generic tractor-trailer vehicle over the road.

(2) Provide an interactive driving environment in normal and hazardous traffic conditions, where every action/inaction taken by the driver generates an appropriate response from the device.

(3) Operate on 115 volts/60 cycle and 220 volts/50 cycle AC electrical power.

(4) Require no special facility, temperature range or humidity control beyond that normally used for PC-type computers (TEMP RANGE: 60-80 degrees; RELATIVE HUMIDITY: 10-95% non-condensing.

REVISED JUL 91

(5) Be capable of being disassembled, moved, and reassembled by no more than four persons.

b. Student Station: The Student Station (cab) will replicate the driver's compartment of an actual truck:

(1) It will be a full enclosure with cutouts in the forward, right, and left sides for viewing a 165 degree video display. (Forward cutout will replicate a one-piece windshield; left cutout will replicate a left side door window; right cutout will replicate a right side door window. Spaced between windshield and side window cutouts ("posts") will be no wider than 3 inches.) The station will have a door to permit student entry/exit.

(2) The interior of the Student Station will contain:

(a) A replica of an actual truck dashboard, with the following analog instruments, operated by the computer: speedometer (analog/digital interface); and tachometer (analog/digital interface). The following analog gauges and electrically-operated switches, will be replicated on the dashboard, but not operated by the computer: oil pressure gauge (on/off only); air pressure gauge (on/off only); headlight switch (on/off only); and left/right turn indicator lamps (arrows).

(b) Column-mounted steering wheel, interfaced with the computer and interactive with the simulation. A turn signal switch will be mounted on the steering column, but need not interface with the computer. The turn signal switch will cause left/right indicator lamps to light on the dashboard of the Student Station.

(c) Transmission lever with 5-8 forward speeds and 1 reverse speed, interfaced with the computer and interactive with the simulation.

(d) Brake pedal, clutch pedal, and accelerator pedal, interfaced with the computer and interactive with the simulation.

(e) Adjustable driver's seat (single seat), equipped with a seat belt that has a mechanism to alert the driver when the belt has not been fastened.

(f) Sound system to present the sounds associated with the simulation. (See para 5e(8))

REVISED JUL 91

c. The Visual System will use Computer Generated Interactive (CGI) graphics:

(1) Field of view will be at least 165 degrees by 45 degrees forward, 25 degrees by 40 degrees to the rear. Visuals will be positioned at least 30-40 inches away from the driver.

(2) Scene Content will consist of at least 70 miles of roadway driving area containing: two-lane highways; multiple-lane highways; gravel/dirt roads; hills; mountains (w/various gradients up to and including 10 degrees); trees (for depth perception); buildings, in metropolitan areas (towns); official state/federal pavement markings (center lines, divided highway, right/left turn arrows, pedestrian crosswalk, etc.); official traffic signs (stop, yield, merge, exit, enter, speed limit, etc.); functioning traffic signals (three-way red/yellow/green signal lights; changing light conditions (from bright daylight to dusk); changing visibility conditions (from clear to fog); moving random vehicles (0-4 in rural areas/0-10 in towns); moving random pedestrians (0-1 in rural areas/0-2 in towns); urban environment (streets, buildings, traffic, pedestrians); rural environment (dirt/gravel roads); interstate environment (high-speed highways); and a loading area (loading docks, other trucks, etc.)

(3) Object Resolution will permit the identification of an 8x8 foot moving vehicle at approximately 1/2 mile.

(4) Scene Quantity/Quality will contain a minimum of 3000, maximum of 5000 surfaces per full viewing area, depending upon the location of the vehicle in the driving area, with an average update rate of 15 HZ over the entire data base, and a minimum update rate of 10 HZ.

(5) Visual Requirements are:

(a) Correct perspective and geometric masses of all video objects, depending upon self-movement (full, CGI moveable eye contact).

(b) Large quantity and variety of 3-dimensional objects which permit estimation of distances.

(c) Correct adjacent concealment of all 3-dimensional objects.

(d) Visual presentation of ground relief and inclines.

REVISED JUL 91

(e) Presentation of buildings, obstacles, trees, hills, etc., with sufficient detail to determine one's position.

(f) Presentation of weather conditions of fog, cloud cover, and sunlight.

(g) Presentation of various levels of intensity to simulate various periods of the day.

(h) Surface shading dependent upon sun position.

(i) Presentation of a large quantity of active and passive traffic participants.

(j) Presentation of continuous motion.

(k) Arbitrary uninterrupted driving within the driving course (on/off-highway).

(l) Sufficient resolution for discovering, recognizing, and identifying objects, such as traffic signs, road markings, etc.

(m) Collision detection of vehicles, pedestrians, buildings, and traffic signs.

(n) Random vehicles/pedestrians will be present in city, rural, and expressway training scenarios. The vehicles/pedestrians will act autonomously to demonstrate both normal and erratic driving behavior, irrespective of actions taken by the student. It must be possible for random vehicle/pedestrian behavior and density in an area to be selected by the instructor at the Instructor Operating Station (IOS).

(6) Rear Visuals (rear view mirrors). The trainer will have fully functioning rear view mirrors which are: imbedded in the forward 165 degree video at a point approximately 45-60 degrees from center; approximately 8" x 14" in size and positioned vertically to the left and right of the driver at the appropriate line of sight; can be seen through the left and right window cutouts unobstructed; provide a view of the trailer at all times during the simulation; operate in synchronization with the forward video; and operate independently of one another.

(7) Visual Scenarios. The trainer will provide interactive scenarios which present all of the driving situations presented in subparagraph 5c(8). Scenarios will be interactive such that every action/inaction taken by the driver generates an appropriate response from the trainer.

REVISED JUL 91

(8) Driving Situations. The trainer will have the following driving situations:

(a) Maneuvering in moving two-lane traffic: changing lanes; executing proper left and right turns; yielding right-of-way; reacting to traffic signals, signs, lights; maintaining safe following distances; maintaining posted speed; and negotiating posted/blind curves.

(b) Maneuvering on multiple-lane highways: merging techniques; changing lanes/signaling; reacting to roadway obstructions; overtaking and passing other vehicles; and maintaining safe following distance.

(c) Backing-up techniques: backing into loading dock from blind side; backing into loading dock from sighted side; backing into an angle-dock loading facility; maintaining safe backup speed; applying correction/overcorrection when backing; judging the correct distance between vehicle rear/loading dock and between vehicle sides/other vehicles.

(d) Truck handling emergencies: steering around roadway obstacles; making an emergency stop; avoiding potential collisions with other vehicles; avoiding a head-on collision; reacting to trailer skid on slippery pavement or loose gravel.

(9) Optical System. The preferred optical system is three or more 67-inch high-gain, high-resolution, non-interlaced, color, rear-projection video projectors. Each projection system must have a resolution of 640 horizontal lines and 480 vertical lines with a 60 HZ frame rate. Any similar system producing this quality video is acceptable.

d. Instructor Operating Station (IOS)

(1) The trainer will have an IOS containing: a computer, with at least 1Mbyte of RAM and 256 Kbytes of ROM w/3-1/2" double density diskette drive; and a color monitor. The IOS will permit the instructor to perform the following actions:

(a) Setup the simulation: initialize the system; select the driving route; select the vehicle load configuration; select the roadbed surface; select the behavior and density of random vehicles/pedestrians; select the visibility; and select the weather condition.

REVISED JUL 91

(b) Monitor and remediate student actions: observe student actions by selecting between two views of the simulation (forward view and overhead view); stop the simulation at a point where the instructor detects a student error; provide a play-back feature to permit the student to proceed from the spot of the error and go through the activity again.

(c) Evaluate and score student performance: evaluate the student's ability to perform correctly in each driving situation (subjective evaluation made by the instructor as he observes student actions at the Student Station); determine the number of times the student exceeds the speed limit during the overall simulation (driving speed versus posted speed limit). Computer calculates this statistic; determine the number of times the student followed too closely during the overall simulation (distance X rate X time factoring. Computer calculates this statistic; determine the number of times the student was/was not in the appropriate gear for the traffic condition, highway speed and gradient. Computer calculates this statistic; determine the number of times the student correctly/incorrectly applied the brakes during the overall simulation. Computer calculates this statistic.

e. Computer(s). The trainer will have computers capable of the following:

(1) Creating CGI scenarios to train the required driving situations, and projecting visuals of the scenarios onto a 165-degree forward display. The computer(s) will be capable of simultaneous projection of rear view images onto rear view mirrors embedded in the forward display. The computer(s) will also be capable of creating and projecting an overhead view of the driving area, which can be accessed by the instructor, through a switching mechanism, at any time during the simulation.

(2) Collecting, tabulating, and summarizing on the IOS monitor, student performance data on maintaining the correct speed, maintaining the correct following distance, correct use of brakes, and correct gear shift range selection.

(3) Creating an interaction between the analog gauges and vehicle operating controls in the Student Station and the simulation (analog/digital interface). Every action taken by the student will result in an appropriate response in the simulation.

REVISED JUL 91

(4) Creating a vehicle dynamics model to simulate an 18-wheel tractor/semitrailer combination vehicle. Vehicle gross combination weight will be 60-80,000 pounds with the trailer attached trailer size will be 48 feet long; engine will be approximately 300-350 horsepower; transmission will have 5-8 forward speeds and 1 reverse speed.

(5) Creating a road surface model to simulate the effect of truck tires on different roadway surfaces. The model should simulate paved surfaces, gravel surfaces, and dirt surfaces. The effect of wheel spin on loose surfaces and stability loss of gravel surfaces is required.

(6) Creating a steering model to control vehicle eye-point movement in the simulation.

(7) Creating a braking model to control/evaluate time, rate, distance factors effecting correct stopping distance.

(8) Creating a sound system model to generate driving sounds and integrate them into the visual presentation. Sounds will be: engine noise caused by changes in RPM when accelerating/decelerating; tire skidding; tire contact with roadbed; vehicle turning; transmission clunk; transmission gear grinding; air brake noise; tire blowout noise; and collision noise.

f. The trainer will be capable of treating situations which train the subtasks listed in Annex C.

g. Each device will be overpacked with an operator's manual, containing information on device setup and operation; required operator maintenance; spare parts listing; and definition of the logistics support concept.

6. Distribution: The basis of issue plan (BOIP) identifies 10 systems located at CONUS sites (See Annex B). A system is one DST training device.

7. Source: Professional Truck Driving Simulators, 777 E. Eisenhower Parkway, Suite 650, Ann Arbor, Michigan 48108 meets the minimum requirements of the U.S. Army Transportation School.

8. Cost:

a. Known costs are \$220,000 per system. A system is one DST trainer (10/2.2M).

REVISED JUL 91

b. Total number of items to be procured: 10 ea.

c. Total procurement cost. \$2.4 million

9. Date required: 4th QTR FY 91

10. Support organizations: Logistic support will be a combination of contractor logistic support (CLS) and Director of Industrial Operations (DIO) support. Devices shall be accountable to the servicing Training Area Support Office and will be hand receipted to commands/agencies in Annex B.

11. Impacts:

a. MCA: None

b. Personnel. No additional manpower required. Annual maintenance man-hours, 200: operator - none; supply economy - none.

c. Device will not support or replace other devices.

d. Special transportation requirements: None

12. List of spare parts required: Initial stockage level of spare parts as determined by manufacturer's minimum stockage list required. Training courses for Instructor/Key Personnel Training (IKPT) in device operation/maintenance required (10/\$.15M).

13. List of special tools required: None

14. Funding summary:

	FY 91	FY 92	FY 93	FY 94
Investment	10/\$2.4M	---	---	---
O&S	---	10/\$48K	10/\$48K	10/\$48K
MLLCON	---	---	---	---

15. Point of contact: Mr. Gary Burianek, ATSP-CDM-T, AUTOVON 927-6693/6692.

Annex A: PTDS

Annex B: Distribution Plan

Annex C: POI Task List

REVISED JUL 91

ANNEX B

DISTRIBUTION PLAN

Limited distribution is planned for the training base as follows:

8 each - 58th Transportation Battalion, (Motor
Transportation Operator AIT Course), Ft
Leonardwood, MO

2 each - USA Noncommissioned Officer Academy
(Motor Transportation Operator Basic/
Advanced NCO Course) Ft Eustis, VA

REVISED JUL 91

ANNEX C

TASK LIST

COURSE: 811-88M10, Motor Transport Operator Course 811-F3,
Petroleum Course

551-721-1307 Operate Vehicle with Manual Transmission
551-721-1332 Operate Vehicle with Automatic Transmission
551-721-1330 Operate Vehicle with Pintle-connected Trailer
551-721-1331 Operate Tractor and Trailer

Subtasks:

1. Execute proper left/right turns.
2. Yield right of way.
3. React to traffic signs/signals/lights.
4. Maintain correct driving speed.
5. Enter/exit multiple lane highways.
6. Execute lane changes/signals.
7. Overtake and pass on multiple-lane highways.
8. Maintain following distances between vehicles.
9. Negotiate posted/blind curves.
10. Back vehicle into loading dock from blind side.
11. Back vehicle into loading dock from sighted side.
12. Maintain correct backing speed and safety.
13. Respond to handling emergencies.
14. Take defense measures when faced with roadway obstacles (collision Avoidance).

REVISED JUL 91